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GAMMA ISODOSAGE CONTOURS
FROM THE X-10 PILE

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GAMMA ISODOSAGE CONTOURS
FROM THE X-10 PILE

by

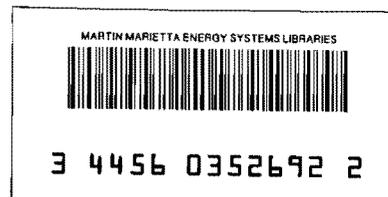
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GAMMA ISODOSAGE CONTOURS FROM THE X-10 PILE

ABSTRACT

The intensity of gamma radiation in the building which houses the X-10 pile was determined. Isodosage contours were made by drawing lines to connect points of equal intensity. Scaled drawings are used to present data.

GAMMA ISODOSAGE CONTOURS FROM THE X-10 PILE

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Gamma Isodosage Contours from the X-10 Pile

INTRODUCTION

The gradations in gamma radiation intensity resulting from operations in and around the chain-reacting pile at Oak Ridge National Laboratory were measured by taking counts with a calibrated Geiger tube feeding two Higginbotham circuited scalars.

Counts were taken at arbitrary locations and interpolations were made to determine intensities between counting stations. Counts per minute were converted to approximate milliroentgens per hour and the results plotted on scaled floor plans.

Observations were made at three horizontal levels about the pile on as many sides and as far out as the building structure would permit. Results of the survey are shown in the drawings. Explanations for apparent discrepancies appear in the discussion.

Gamma Isodosage Contours from the X-10 Pile

DISCUSSION

I. Equipment

The instruments used in this survey were two scalers (Higginbotham circuit, scale of 64) fed by carefully calibrated Geiger tubes. The operating voltage on both tubes was 1050 volts. While counting rates per milliroentgen per hour of these instruments are dependent upon the distribution of energy of radiation, approximate calibration is effected by use of a radium source. For the radiation from such a source, one tube gave 4325 counts per minute per mr/hr and the other gave 5100 counts per minute per mr/hr.

II. Methods and Procedures

The three most nearly continuous floor levels in the building were chosen as the base horizontal planes for the survey. Coordinates were drawn on these floor levels with lines perpendicular to the pile faces at intervals of 13.5 feet. Lines parallel to the pile faces began at 31 inches from the faces. In order to obtain greater accuracy in the area where the greatest rate of change was anticipated, the next two lines were drawn at 5 feet intervals and from there out to the building walls, the interval was set at 10 feet.

At each point of intersection of these lines a three minute count was taken at a height of 54 inches above the horizontal reference plane. This vertical distance was initially selected so that all counts on the first level (ground floor) could be taken without interference due to the

Gamma Isodosage Contours from the X-10 Pile

elevation of experimental balconies above the ground floor. It happened that this elevation above the second floor level was less than one foot from a horizontal plane through the center of the pile, so, for uniformity, a height of 54 inches was used as the vertical distance above all reference planes.

The pile was operated at a constant power level throughout the counts for each particular level but varied by as much as 5% between surveys on the different levels. Since the power level is governed by weather conditions, and the survey could not be completed in one day, this variation in power levels was a necessary evil. Rechecks made at several counting stations during a variable power run showed that the differences in counting rate due to a change in power level were almost directly proportional.

The results were plotted on a large scale drawing and reduced photostatically. This means that each figure in the drawings is still to scale, but all are not exactly to the same scale.

III. Interpretation of Results

A. General

The drawings clearly show the occurrence of one or more peak radiation areas near each face on each level. This would be expected in a circumferential survey of any large, non-symmetrical source.

It will also be noted that as the distance from the pile increases, the rate of reduction in counting rate with distance is generally less than one might predict. This effect is readily traceable to the contributions by sources other than the pile.

Gamma Isodosage Contours from the X-10 Pile

B. Specific

1. First Level

The peak on the south side of this level is the result of an experimental facility in use near the west end of the experimental balcony, using a catcher type shield, and resulting in considerable scattering.

The countours on the west side of this level could not be closed because the construction program in that area prohibited the collection of data at greater distances from the pile face.

The peak on the north side of this level is primarily caused by the location of a probe sampling device used to indicate activity levels in the exhaust stream of coolant air from the pile.

2. Second Level

The peak on the south side of this level appears approxi- in the center of the pile face. The broad space gap between the two mr/hr and one mr/hr lines is due to the presence of radioactive materials on the storage balcony. These same lines are spread again near the pile face, probably due to the contribution from a pneumatic tube facility which enters the pile shield in that area. These irregularities are exaggerated in the crane well area due to scattering from the east face.

The twin peaks of 1.7 mr/hr near the east face are the result of the loading pattern of the pile.

The other two faces on this level could not be surveyed because the area adjacent to them was not structurally suitable.

Gamma Isodosage Contours from the X-10 Pile

3. Third Level

Peaks on the north and south sides of this level are largely the result of the operation of experimental facilities there, with an additional contribution on the south side from the materials on the storage balcony in the southwest corner.

Gamma Isodosage Contours from the X-10 Pile

ACKNOWLEDGEMENTS

The survey work forming the basis for the report was performed by A. D. Warden, D. M. Davis, J. Burden, P. O. Martin, and R. L. Clark. Drawings were done by P. O. Martin. The report was written by R. L. Clark.

X-10 PILE

ISODOSE CONTOURS.

by

R. L. Clark

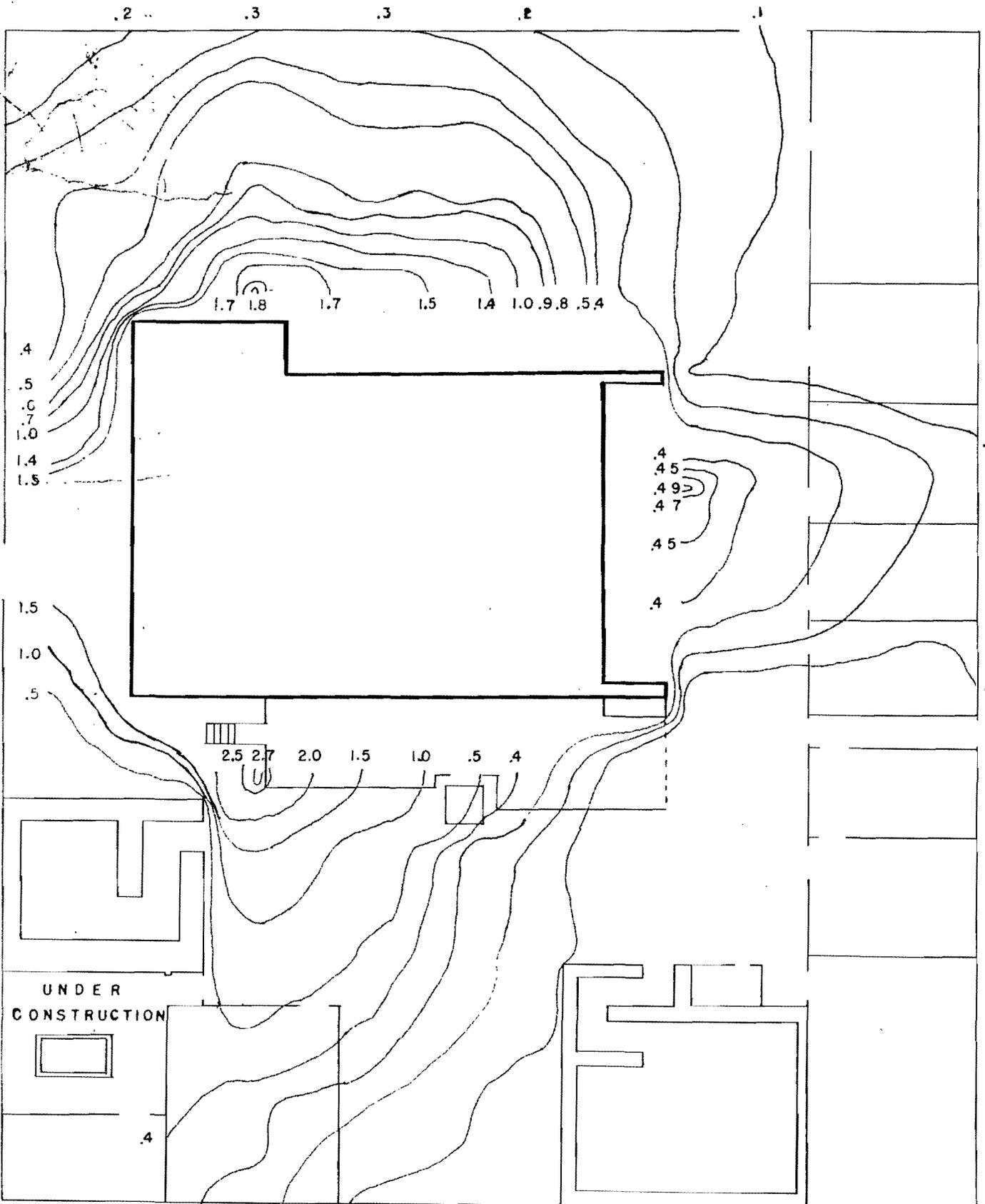
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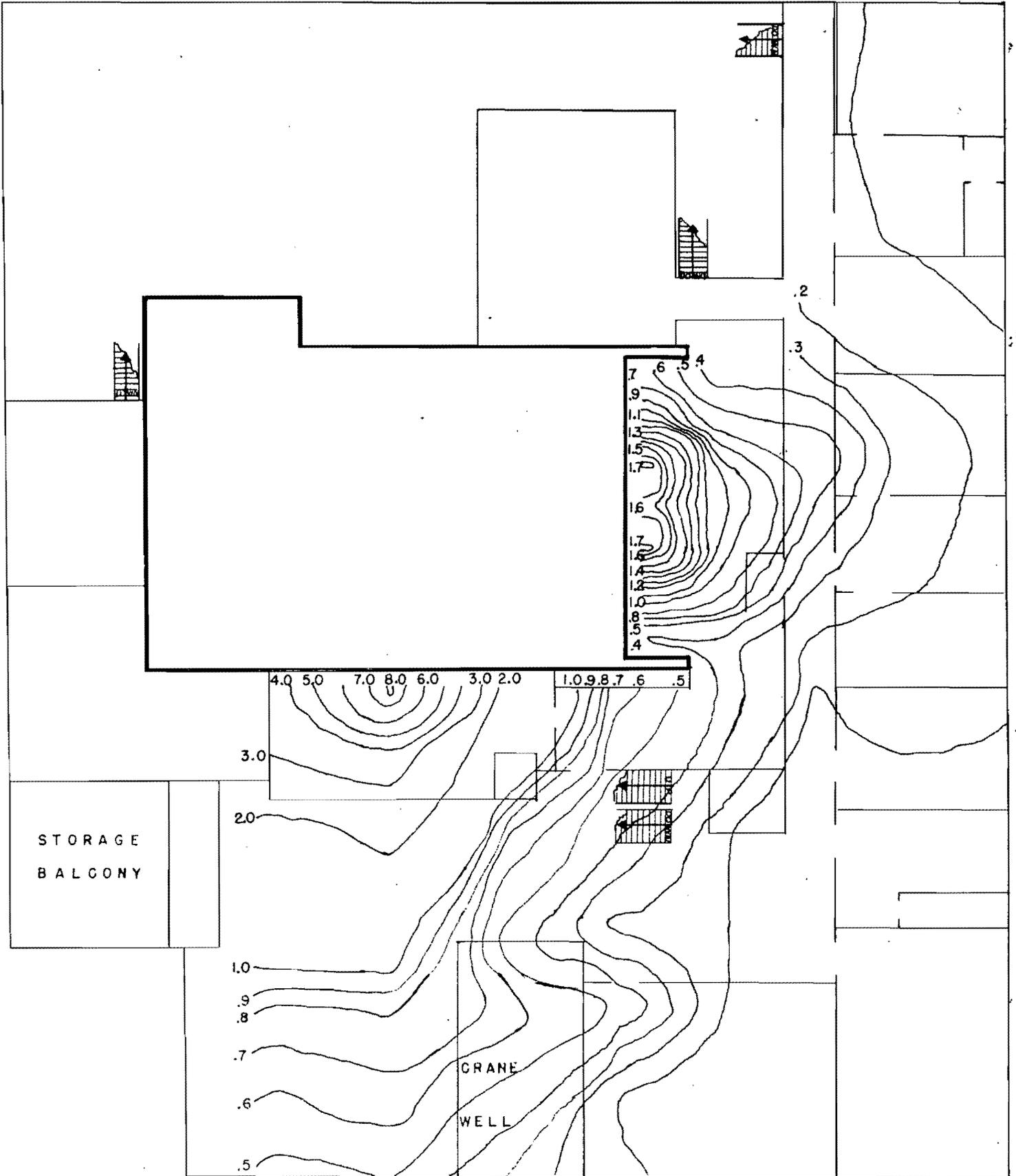
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1 March, 1950.

Radiation levels are quoted in mr/hr.



FIRST LEVEL.



SECOND LEVEL.

SCALE: $\frac{3}{32}'' = 1'$

